

IMPLEMENTATION OF THE BIODEFEND® SYNDROMIC SURVEILLANCE SYSTEM: ELECTRONIC FORMAT VERSUS WEB-BASED DATA ENTRY IN SPECIAL EVENT SURVEILLANCE FOR SUPER BOWL XXXIX IN JACKSONVILLE, FL

C Farrell¹, P Frank², S Zaheer², V Minden³, J Perry², JP Tanner¹, M Fleming¹, and J Cattani¹

¹Center for Biological Defense, College of Public Health, University of South Florida, Tampa, FL, ²Duval County Health Department, Jacksonville, FL, ³Datasphere, LLC, Battleground, WA

Abstract

The threat of bioterrorism (BT) surrounding a major, high profile event forces the public health infrastructure to focus attention on challenges posed by emerging and re-emerging infectious diseases. A goal of this research study was to determine if it is feasible for healthcare facilities to modify their patient information systems (PIS) to collect provider-identified syndromes and to evaluate the technical approaches to automated data collection. The project also addressed the HIPAA issues related to data sharing and aggregate reporting across multiple counties. The study was conducted in five Florida counties by the Duval County Health Department. Eight hospitals were identified to participate because of their proximity to the Super Bowl and related venues. A one-month period of baseline data was collected (at most facilities) to identify normal illness trends. Five facilities transmitted data via a digital bridge from their patient information system directly to BioDefend® servers. Three facilities entered data via a web-based form. An automated tool analyzed provider-identified syndromes and sent alerts via an email-enabled device when increases of syndromes exceeded the pre-established thresholds.

Automated data collection of provider-identified syndromes is a reasonable approach for near real-time syndromic surveillance. Collecting data via a digital bridge directly from the healthcare facility's PIS increases timeliness of reporting by 8 hours over manual collection via a web-based form. A limitation of this approach is the necessity to modify the PIS. Strengths of automated data collection include reducing the burden on healthcare providers as well as increasing the timeliness of data collection and analysis. An additional strength of the BioDefend® system is the explicit agreement for data releasability which was required by some facilities for participation. The security model of the automated reporting system allowed epidemiologists in multiple counties to study aggregate disease patterns by syndrome without giving access to the individual de-identified records of patients in a county outside their own. Patient confidentiality and security concerns must be addressed early in any syndromic surveillance implementation to secure the cooperation of healthcare providers. The system continues to be used in ten counties in North and Central Florida.

Introduction

Jacksonville, Florida was host to Super Bowl XXXIX on February 6, 2005. Duval County Health Department (DCHD) was a lead agency for public health and hospital preparedness efforts for this special event. Bioterrorism surveillance is an integral component of DCHD's Comprehensive Emergency Management Plan. Many types of surveillance are routinely used by DCHD and for this large event three additional surveillance systems were implemented. The three systems included BioDefend® which utilizes provider-identified syndromes, CDC's Early Aberration Reporting System (EARS) which uses chief complaints and ICD-codes, and cruise ship surveillance. BioDefend® and EARS were implemented with the intention of making them permanent components of Duval's surveillance system.

This study was a collaborative effort between Duval County Health Department, University of South Florida's Center for Biological Defense (CBD), and DataSphere, LLC. DCHD's role in the project was to identify surveillance sites, involve community partners, share data/info with surrounding counties and the state department of health, and secure funding for the system. CBD's role in the project was facilitating the operational and technical implementation of the system and serving as a liaison between hospitals, health departments, and DataSphere, LLC. DataSphere, LLC owns and operates BioDefend® and was responsible for the technical setup and maintenance of the system. The purpose of this study was to evaluate the implementation of the BioDefend® syndromic surveillance system for its use in special events. The study addressed the feasibility of automated data collection by healthcare facilities and issues related to implementation of a syndromic surveillance system.



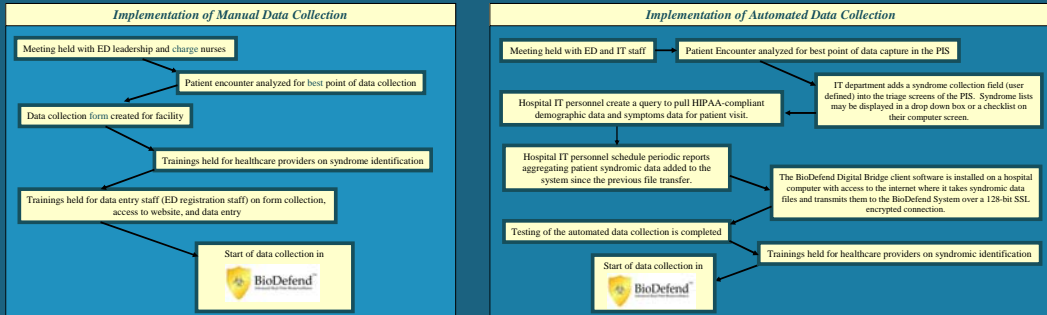
Figure 1. BioDefend® System Visualization

Methods

Duval County Health Department (DCHD) selected the BioDefend® syndromic surveillance system for use in developing a regional surveillance system to be used for special event surveillance and for long-term continuous use. DCHD identified four additional counties to participate in the project due to their proximity to Jacksonville and the healthcare facilities within their jurisdiction. Ten hospitals were invited to participate in a one year pilot project by their health department and eight hospitals agreed to participate (Hospitals A-H).

A requirements analysis was conducted at each surveillance site to determine the facility's data collection method and whether customization was required for site participation. The emergency department's (ED) workflow was evaluated to determine the point of data collection with the least impact on workflow. Once a data collection method had been established and tested at each facility and health care providers were trained, the surveillance site started data collection. The participating surveillance sites collected information on 9 syndromes including 'respiratory', 'influenza-like illness', 'gastroenteritis', 'rash with fever', 'neurological', 'botulism-like illness', 'sepsis, non-traumatic shock', 'unexplained death with history of fever/coma' and 'no syndrome'. Healthcare professionals were trained to correctly identify each syndrome. A ten-minute training was conducted in the ED before the start of data collection at each facility. Syndrome Reference cards (ringed 3x5 laminated cards with syndrome definitions) were located at points of data collection in the ED. The cards functioned as a reference for healthcare providers and served to improve the validity of the syndromes chosen. Most facilities started data collection one month before Super Bowl in order to establish a baseline for analysis. The BioDefend® system has two types of data collection methods; manual and automated.

The criteria for evaluating the strengths and weaknesses of each data collection method are: participation, timeliness for implementation, and timeliness of reporting. Data granularity and the Health Information Portability and Accountability Act (HIPAA) were two issues addressed during implementation.



Results

Duval County Health Department choose the BioDefend system for many reasons. BioDefend® operates in near real-time, provides the needed security, allows for the appropriate data granularity, and is cost efficient.

Participation

There were ten hospitals approached to participate in this project and eight accepted. Hospitals A-C were originally approached for automated data collection and declined. They chose to participate in the project using manual data collection methods due to changes occurring to their existing patient information system (PIS). When a new PIS is implemented in these facilities, the hospitals will start automated data collection. Hospital D declined to participate at the time because of construction to their facility and Hospital E was unable to modify their patient information system at the time. Both Hospitals I & J expressed interest in participating in the future upon resolution of issues. (Table 1)

Timeliness of Implementation

Funding for the BioDefend® project was secured in late July 2004, allowing for six months to implement in all facilities. Time restrictions on implementation included health department and hospital personnel time for response to four hurricanes and the requirement for at least one month of data collection to establish a baseline for analysis. The time required for implementing automated data collection is greater than for manual data collection. For a special event, the use of manual data collection was acceptable. Manual data collection was implemented rapidly after gaining approval from leadership. The implementation of automated data collection was labor intensive requiring instruction and interaction with emergency department staff and information technology personnel.

Timeliness of Reporting

It was found that automated data entry systems were more timely than manual sites. Automated sites transmit data over the digital bridge at adjustable set intervals. This interval is determined by the healthcare facility information technology department and is based on a balance between timeliness of data transmission and hospital server time. The manual sites in this study did enter data in a timely manner. Possible explanations for the timely manual data entry were an understanding of the need for timely data entry by staff, the ease of data entry, directives from leadership, the hype of a large event occurring or most likely a combination of these reasons. In order to facilitate manual data entry, the entry website mimics the paper form used at the facility. This reduces misclassification of diseases and reporting errors. The completed syndrome forms are held for one month to facilitate investigation, if an outbreak was detected.

Data Granularity and HIPAA Issues

The data architecture of the BioDefend® system allows for maximum data granularity. Participants give explicit releasability instructions, allowing/denying access to other facilities, county PH, regions, state, or even ad hoc groups created to support an event or emergency. A facility or group can opt to share syndrome counts for regional geospatial analysis without sharing individual encounter records. Public health, emergency operations, and medical personnel considered this flexible data security model critical to the success of any regional surveillance effort. The Florida DOH allows for syndromic surveillance in Rule 64D-3.002 Section jiji. An agreement was created between parties to protect patient confidentiality and maintain HIPAA compliance.

Hospital	Date Approached	Start Date for Data Collection	Issues during Implementation	Data Collection Method	Average Time Delay (hrs)	Patient Information System
Hospital A	9/24/2004 & 12/29/2004	01/11/2005	Lack of functioning PIS	Manual	13.4	Cerner
Hospital B	12/29/2004	01/11/2005	Lack of functioning PIS	Manual	8.2	Cerner
Hospital C	12/29/2004	01/10/2005	Lack of functioning PIS	Manual	15.1	Cerner
Hospital D	9/16/2004	01/05/2005	HIPAA	Automatic	3.6	Cerner
Hospital E	9/21/2004	01/08/2005	Approval from headquarters	Automatic	6.4	Meditech
Hospital F	9/14/2004	12/07/2004	Updates to digital bridge	Automatic	3.8	Cerner
Hospital G	9/17/2004	01/25/2005	HIPAA and training constraints	Automatic	4.5 (not due to limited data)	McCaesen system
Hospital H	10/12/2004	02/03/2005	Difficult to modify PIS/training	Automatic	4.5	Meditech
Hospital I	12/3/2004	-	Facility construction	Automatic	-	Meditech
Hospital J	8/9/2004	-	Unable to gain approval in time	Automatic	-	PGUI

Table 1. Implementation Data for Northeast Florida Hospitals

Conclusions and Implications for Use

- Previous studies has shown that health events can be identified by BioDefend® earlier than routine surveillance methodologies through the use of advanced information technology.
- Timeliness is an important component of surveillance and 'real-time' surveillance is possible.
- Automated data collection is more timely than manual data collection and should be considered for long term, continuous use.
- The automatic transfer of data eliminates the need for manual data entry. This minimizes the burden on providers and increases accuracy of data entry.
- Customizing the system for each site was important so that reporting did not disrupt the work flow or compromise the quality of the data.
- Maintaining HIPAA compliance is essential and can be addressed with an agreement on Protect Health Information.
- Future research on the BioDefend® system includes a validation study of provider-identified syndromes when compared to chief complaints and ICD-9 codes, and an evaluation of all surveillance systems used in Northeast Florida.

References

- Florida Department of Health Reportable Disease List. www.doh.state.fl.us/disease/cdr/cdr-survey.html
- Frank, P and Patterson C. *Framework for Emergency Preparedness* <http://www.dcmssonline.org/lex/mcd-cve-2001/journals/Nov2001/framework.html>
- Uhlde et al. Abstract. Examples of Early Detection of Outbreaks using the BioDefend™ Syndromic Surveillance System MMWR. In publication. 2005
- Uhlde Dissertation. Bioterrorism Syndromic Surveillance: A Dual-Use Approach with Direct Application to the Detection of Infectious Disease Outbreaks. Unpublished. July, 2003

The Center for Biological Defense and Duval County Health Department would like to thank the following people for their contribution to this project: Region 3 RODST, Dr. J Galdagano, R. Kay, C. Bailey, Dr. E. Ngo-Sidd, A. Prugis, K. Cobb, L. Ritter, Dr. D. Allcock, D. Coyle, C. Wolfe, S. Clouse, & participating hospital administrations, EDs, and IT departments.

This work was supported by DOD Contract Number DAAD13-00C0043.

